NOTES ON THE DIET OF *SCINCELLA KIKAAPOA* (SQUAMATA: SCINCIDAE) IN THE CUATRO CIÉNEGAS VALLEY, COAHUILA, MEXICO

NOTAS DE LA DIETA DE *SCINCELLA KIKAAPOA* (SQUAMATA: SCINCIDAE) EN EL VALLE DE CUATRO CIÉNEGAS, COAHUILA, MÉXICO

Saraid Oyuki Bazán-Cárdenas[1], Salomé Rayadan Reyes-Mercado[1], Karen Gómez-Vieyra[1], Marysol Trujano-Ortega[2] and Uri Omar García-Vázquez[1*]

[1]*Laboratorio de Sistemática Molecular, Unidad de Investigación Experimental Zaragoza, Facultad de Estudios Superiores Zaragoza, Universidad Nacional Autónoma de México, Batalla 5 de mayo s/n, Col. Ejército de Oriente, 09230, CDMX, México.*

[2]*Museo de Zoología "Alfonso L. Herrera", Departamento de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional Autónoma de México, Ciudad Universitaria, México 04510, CDMX, México.*

[*]*Correspondence: urigarcia@gmail.com*

Resumen.— *Scincella kikaapoa* es una especie de escíncido micro endémica del Valle de Cuatro Ciénegas. En este trabajo se reporta por primera vez la dieta de esta lagartija, con base en la identificación de su contenido estomacal, la cual estuvo principalmente constituida por artrópodos; de los cuales los arácnidos, himenópteros, coleópteros y ortópteros fueron los grupos de mayor frecuencia.

Palabras clave.— Ecología, contenido estomacal, insectívoro, lagartija, microendémica.

Abstract.— *Scincella kikaapoa* is a micro endemic skink species of the Cuatro Ciénegas Valley. Here we report for the first time the diet of this lizard, based on the stomach contents, which was mainly constituted by arthropods; where the arachnids, hymenoptera, coleoptera, and orthoptera groups were the most frequent.

Keywords.— Ecology, insectivorous, lizard, microendemic, stomach content.

Diet is a fundamental aspect in the biology of an organism, and the evolution of the strategies related to this ecological aspect must have important consequences like in digestive morphology and physiology (Pough, 1973; Herrel et al., 2001), reproductive strategies (Anderson & Vitt, 1990), and habitat use and distribution patterns (Brown, 1991); not only for the lineages who involved these evolutionary adaptations, but for the ecosystems where these organisms live (Espinoza et al., 2004). There have been numerous studies on the diet of lizards based upon the analysis of its stomach content, in which it has been possible to identify intraspecific diet differences through the comparison of the dietary diversity, the importance value of the ingested preys and the trophic niche breadth (Gadsden & Palacios-Orona, 2000; Altamirano-Álvarez & Soriano-Sarabia, 2007; Quispitúpac & Pérez, 2008; Güizado-Rodríguez & Casas-Andreu, 2011).

The Cuatro Ciénegas Valley is a desert region that presents notable and unique aquatic ecosystems; it has ponds, streams, underground tunnels, artesian wells, and cienegas (Pinkava, 1984). In the other hand, the vegetation is represented by grasslands, gypsum dunes, limestone sierras, and aquatic and semi-aquatic habitats surrounding the region (Pinkava, 1984). These characteristics make it a unique region with a high rate of endemic flora and fauna, highlighting the reptiles (McCoy, 1984; Carabias et al., 1999). As an example of this, *Scincella kikaapoa* is a micro-endemic species of the Cuatro Ciénegas Valley, Coahuila, Mexico (García-Vázquez et al., 2010). This lizard presents a terrestrial and semi-aquatic habits, inhabiting in marshes, sedge mats, and the peripheral areas of water courses and lagoons. It has been registered at the shores of ditches and small ponds covered by small halophyte vegetation (<30 cm of height),

Figura 1. *Scincella kikaapoa* de Cuatro Ciénegas, Coahuila. Foto: Uri García.
Figure 1. *Scincella kikaapoa* from Cuatro Ciénegas, Coahuila. Photo: Uri García.

where they probably develop all their activities (McCoy, 1984; García-Vázquez et al., 2010). There are no known aspects of its natural history as their diet.

We analyzed the stomach content of 10 lizards (eight adults: six females and two males; and two juveniles) of *S. kikaapoa* collected between September 2010 and February 2011 (Appendix 1; Fig. 1). We deposited the specimens in the Colección Herpetológica, Museo de Zoología, Facultad de Ciencias, UNAM (MZFC). We extracted the stomachs by dissection and we determined the dry weight of the contents with an analytical balance (OHAUS Model Explorer ProEP214C). We identified the stomach content at the level of order and family when possible, with the use of taxonomic guides (Borror & White, 1970; Leahy & White, 1987). With the data obtained from the presence-absence of the prey, we evaluated the feeding habits of *S. kikaapoa* through the relative frequency (FR = (fi / F)x100) and the frequency of occurrence (FO = (fi / N) x100) of the identified taxa. Where fi = number of occurrences in which a given taxonomic group of prey appears, F = total number of occurrences of all components in all stomachs, and N = total number of stomachs observed. The FO indicates the frequency with which an animal consumes a prey (how common an article is in the total number of stomachs analyzed), while the FR indicates the importance of the species found in relation to the others components. We used the standardized evaluation

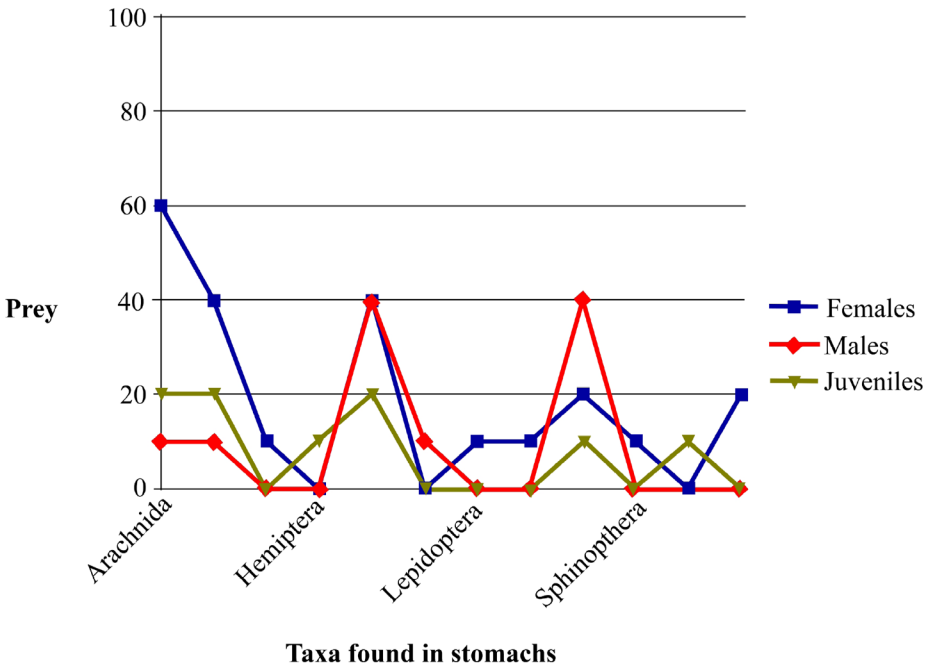

Figura 2. Frecuencia de los resultados de presas obtenidos mediante el método de Lagler (1978) en hembras, machos y juveniles of *Scincella kikaapoa*.
Figure 2. Frequency of occurrences results of preys by the Lagler (1978) method in females, males and juveniles of *Scincella kikaapoa*.

Tabla 1. Frecuencia, frecuencia relativa, porcentaje, y frecuencia del porncentaje de presas consumidas por *S. kikaapoa*. Los números en corchetes indican el porcentaje y el total por grupo taxonómico.

Table 1. Frequency, relative frequency percentage, and frequency of occurrence percentage of prey consumed by *S. kikaapoa*. Numbers in brackets indicate percent and totals by major taxonomic groups.

Taxon of prey	Frequency (fi)	Relative frequency (FR)	Frequency of occurrence (FO) %
Arthropoda	**70**	**[96]**	
Arachnida	**18**	**25.8**	**90**
Insecta			
Coleoptera	13	18.6	70
Diptera	3	4.3	10
Hemiptera	1	1.4	10
Homoptera	1	1.4	10
Hymenoptera	17	24.3	80
Lepidoptera	1	1.4	10
Orthoptera	9	12.9	40
Odonata	1	1.4	10
Siphonaptera	5	7.1	10
Isoptera	1	1.4	10
Vegetable matter	**3**	**[4]**	**20**
Total	**73**	**100**	

scale of Lagler (1978) (as cited in Bajeca, 2016) for the frequency of occurrence data interpretation, this evaluative scale classifies the type of food in primary (>50%), secundary (<50% - >10%) and indicental (<10%). Also we obtained the trophic niche breadth by the standardized Levins' Measure (Krebs, 1999) to express it on a scale from 0 to 1.0, where values that tend to 0 characterize the selective-feeding organisms, and the amplitude values that tend to 1 characterize the generalist organisms. Finally, we performed an analysis of variance (ANOVA) using Fisher's F-test to determine whether are significant differences ($p < 0.05$) in dry average weights of the stomach content of males, females and juveniles using STATGRAPHICS Centurion XVI V. 16.1.18 software (StatPoint Technologies Inc.).

We identified remains of 73 preys from the revised stomachs, of which the arthropods constituted 96% of the relative frequency and the remaining 4% was represented by vegetable matter, the latter present only in two females. Considering only arthropods, 25.8% corresponded to the class Arachnida and the 74.2% to the class Insecta, of which highlight Hymenoptera (24.3%), Coleoptera (18.6%), Orthoptera (12.9%), we observed other occasional prey (i.e. Siphonaptera and Diptera). In terms of frequency of occurrence, the Arachnids presented the higher percentage (90%), followed by Hymenoptera (80%), Coleoptera (70%) and Orthoptera (40%) (Table 1).

Applying standardized evaluation scale of Lagler (1978) to the frequency of occurrence results, females consume Arachnida as primary prey, followed by Coleoptera, Hymenoptera, Orthoptera and vegetable matter as secondary prey, the remaining groups are considered incidental prey groups. Males consume mainly Hymenoptera, as secondary prey are Orthoptera and Coleoptera, and as incidental prey are Arachnida and Homoptera. Juveniles consume primarily Hymenoptera, followed by arachnids and coleopterans as secondary prey; and Hemiptera and Isoptera as incidental prey groups (Fig. 2). The trophic niche breadth of this species was 0.446. The average weight of stomach contents was higher in females compared with males and juvenile. However the statistical analysis do not shows significant difference in the dry weights of stomach contents ($F= 0.31$, $P= 0.74$, $fd= 2,7$) among males, females, and juvenile.

The lizard *S. kikaapoa* eat mainly arthropods, such as Arachnida, Coleoptera, Hymenoptera and Orthoptera. An analysis by Lewis (1951) on the congener *Scincella lateralis* shows a higher consumption of spiders followed by Hymenoptera, Coleoptera, Diptera, Orthoptera and Homoptera; prey that matches with the observed in *S. kikaapoa*, this similarity in the diet, may be due to their close relationship (García-Vázquez et al., 2010). While an incidence of 4% of vegetable matter found in two females, it is not possible to consider that *S. kikaapoa* presents herbivory habits, since the plant matter could be ingested accidentally when catch one of the prey of arthropods, as happens in other skinks (Vitt & Cooper, 1986) including *S. lateralis* (Cooper & Hartdegen, 1999). Within the family Scincidae, some species have also a dietary affinity to a wide variety of terrestrial arthropods such as arachnids, hymenoptera, orthoptera, and coleoptera; which are taken opportunistically in accordance with a wide and flexible ranging foraging strategy, thus indicates that they are generalist's predators (Brown, 1991; Wapstra & Swain, 1996; Caicedo-Portilla et al., 2010). Although males, females, and juvenile have different primary prey based on the results from Lagler (1978) method, we cannot infer if they are not selective with their prey due to sex or stage because our small sample size.

However, *S. kikaapoa* could be having an active foraging pattern of diet that has been reported in most species of the Autarchoglossa clade (Vitt & Pianka, 2005; Ramírez-Bautista et al., 2009), to which the family Scincidae belongs. This strategy, predators have to get around and they search for prey that provides more energy than invested to obtain them. Sedentary, numerous, clustered, small and locally abundant prey, such as ants or coleoptera, are mainly consumed (Vidal & Labra, 2008). In addition, it has been proposed that some species of small body size, like *S. kikaapoa*, tend to be mainly insectivorous (Pough, 1973). Although the value of the trophic niche breadth seems not to be markedly high, the diet of this species is variated.

Therefore we can conclude that *S. kikaapoa* has a primarily insectivorous diet that seems to correspond to the trends of ranging foraging from the opportunistic generalist species of the family Scincidae.

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APPENDIX I

List of *Scincella kikaapoa* specimens used in the analysis of stomach contents. The institutional museums where specimens are collected is Museo de Zoología "Alfonso L. Herrera", Facultad de Ciencias, UNAM.

Scincella kikaapoa: México: Coahuila: MZFC 29621-22, MZFC 29624-25, MZFC 29627-29, MZFC 29631, MZFC 29637, Antiguos Mineros del Norte, Cuatro Ciénegas (26.7879417 N, 102.0019889 W, 710 m.s.n.m.); MZFC 29638, Churince, Cuatro Ciénegas (26.8406306 N, 102.1341723 W, 766 m.s.n.m.).